



# DWA update and review proposal

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APA Consortium Meeting

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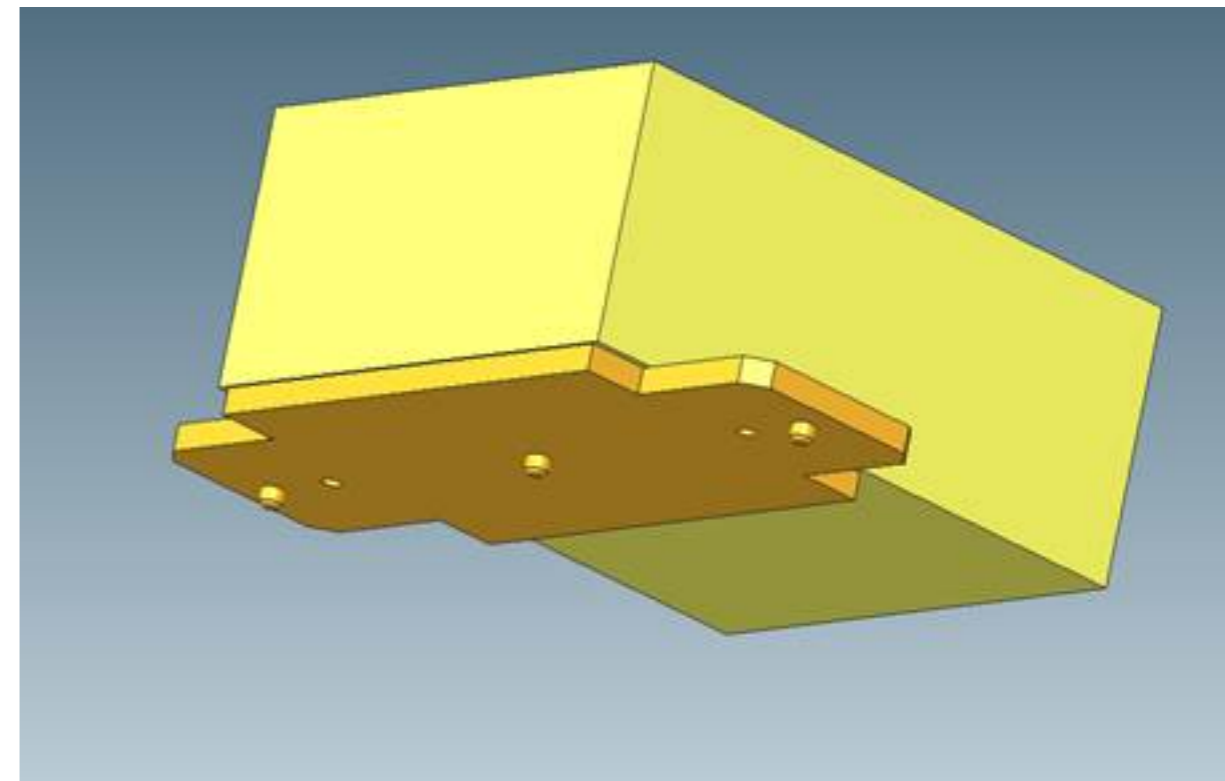
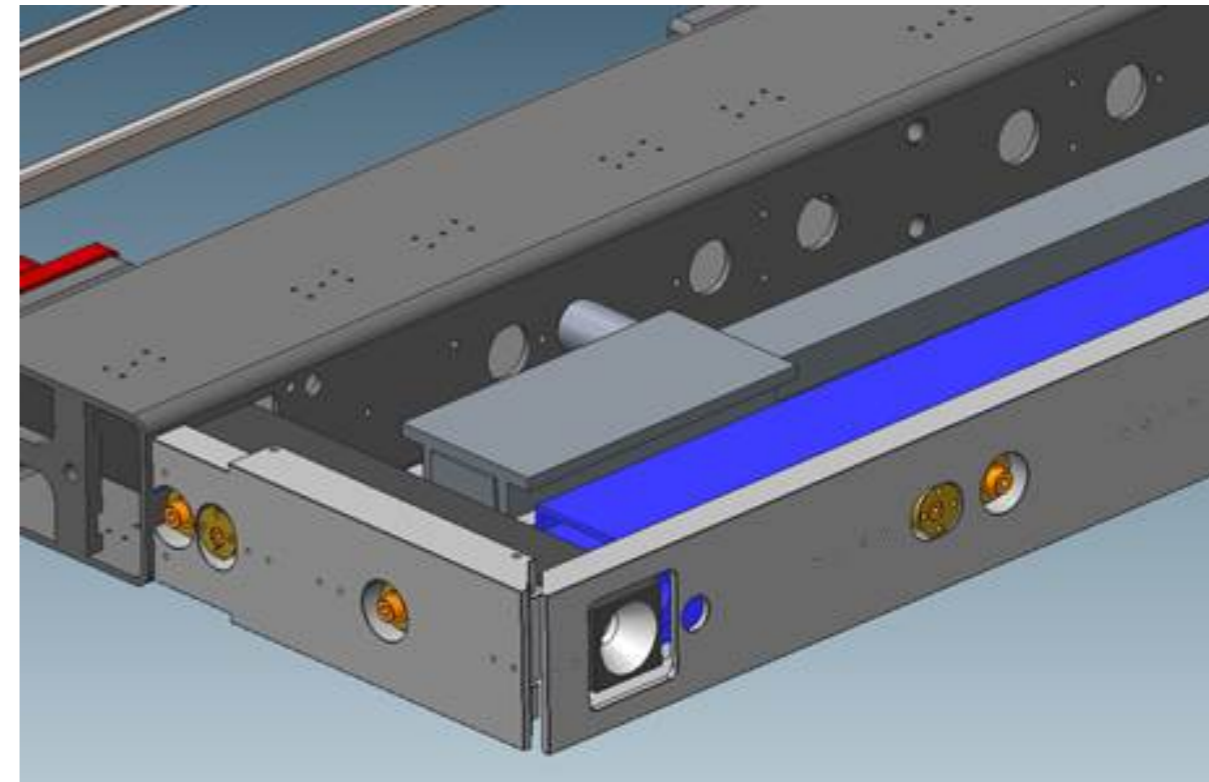
- ▶ DWA updates
  - Mounting on APA
  - Power distribution
  - Multichannel readout
  - Others
  
- ▶ Proposal for the approval of the electrical tension measurement method

# Updates

# Mechanical support concept



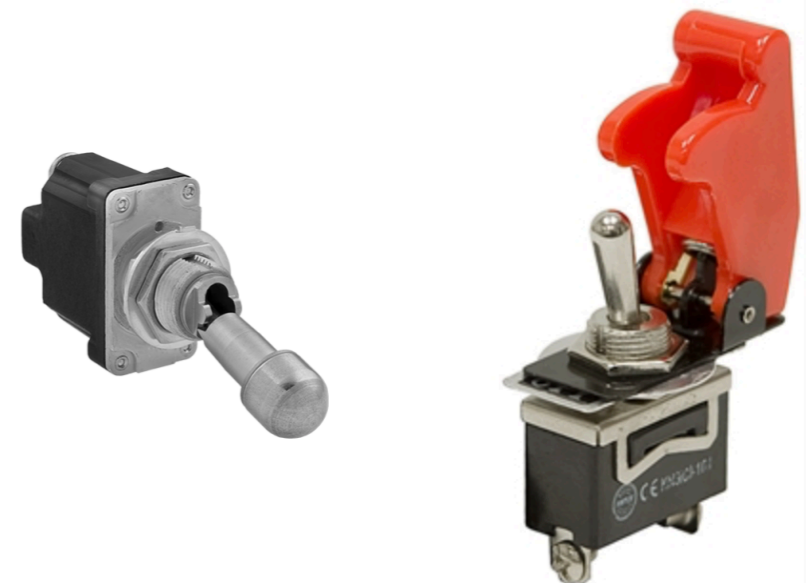
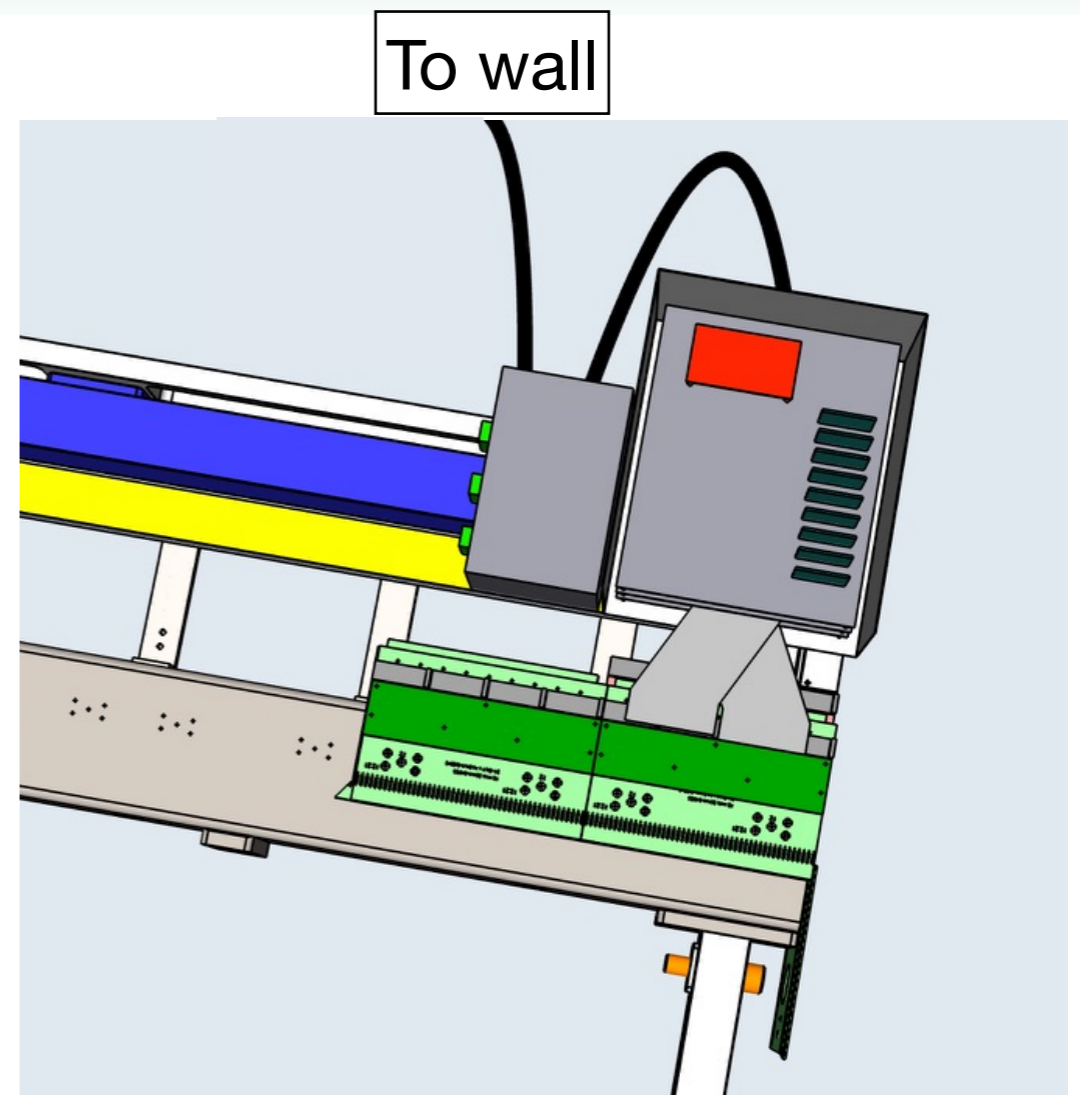
- ▶ Met with Kevin and Alan to discuss mechanical support
- ▶ Current idea is to use 80/20 bar
  - One bar for each APA side
  - Supported itself by ~4 tees similar to CE tees
  - Lower than head boards so can stay in place while winding
  - Can be used in other testing environments
- ▶ Linear bearings to slide along bar
  - Handle to be used as brake
- ▶ Mounting plate under instrument enclosure



# Power Distribution Box

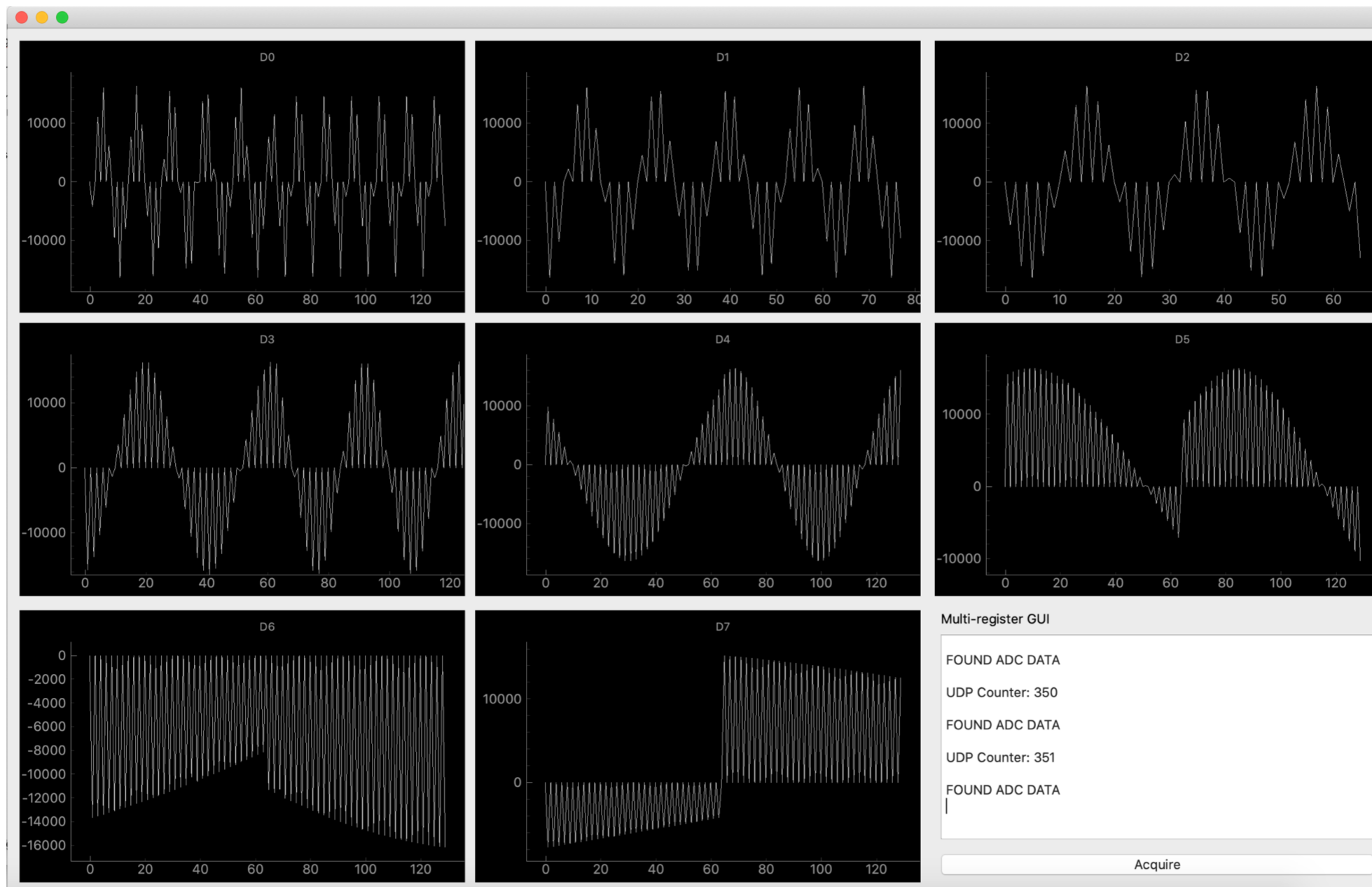


- ▶ DWA v3 needs as input
  - Up to 10 A at 5 V
  - Wall AC signal for noise subtraction
- ▶ External power distribution box
  - Close to DWA box and slides with it
  - Idea is to swap the two boxes at the edge of the support bar
  - Will have switches, LEDs and pushbuttons
    - 3 switches:  $V_{AC}$ ,  $V_{DC}$ , overall power
    - Switches that can't be accidentally actuated
    - Thanks for safety feedback from Ben and Duane



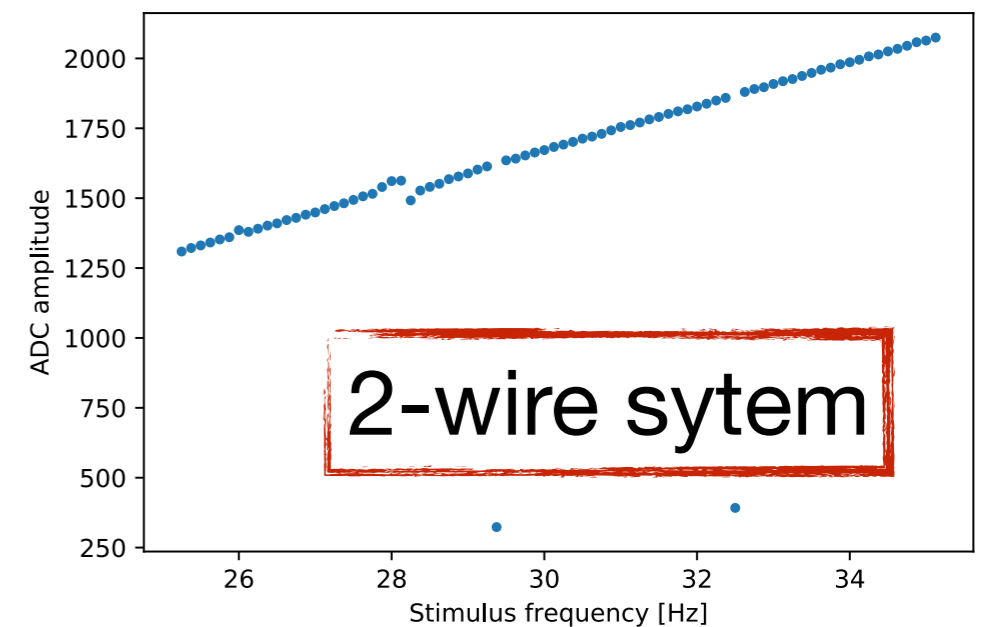
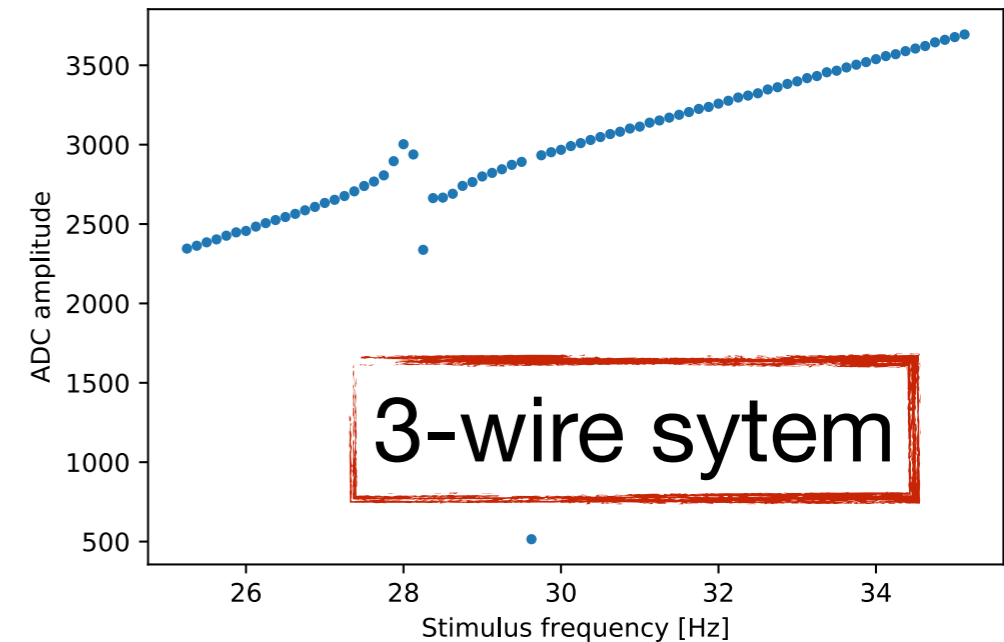
# Multichannel readout

- ▶ Simulated data at different frequencies
  - Running on hardware and sent to computer
  - Test of multichannel DAQ system produced by James



# Various updates

- ▶ Considering if edge wires require additional hardware (e.g. a ribbon cable)
  - Preliminary testing shows it might be possible
    - But done at low frequency, so further testing needs to be performed
- ▶ V3 schematics of analog board nearly completed
  - Will have a review and then layout work can start
- ▶ Electrical continuity and charge splitting requires capacitance calibration
  - Channel dependent as wire boards have different trace lengths
  - Need to have boards to measure channel capacitance



# Review proposal



# Upcoming milestones



## Upcoming APA Reviews


- APA Transport Frame Review, July 28-30
- APA Preliminary Design Review “Refresh”, August 11?
- APA Final Design Review, September?
- Production Site Readiness Review - UK ??
- Wire Tension Measurement Internal Review ?
- APA Production Site Design Internal Review – USA ???

From Alberto: <https://indico.fnal.gov/event/44271/>

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# Overview of approval proposal

- ▶ Approval of use of electrical wire tension measurement method for the APAs
  - Approval based on the outcome of a review process
- ▶ Review process to be performed in two stages
  - Preliminary design review
    - August 26th
  - Final design review
    - November or December
- ▶ All the details are in <https://docs.dunescience.org/cgi-bin/private/ShowDocument?docid=20087>



- ▶ Goal of preliminary review
  - Get the whole APA consortium in tune with what the DWA can do
    - If something critical is missing, better there's still time to implement it
  - Get some amount of approval before
    - APA final design review in September
    - Shipping of DWAv3 to production sites in October
  
- ▶ Goal of the final review
  - Get approved as method for the APA production
  - Get approval before
    - Production readiness review early next year

# Review format and expectations



- ▶ Format of the reviews still open
  - Informal process
    - Within APA consortium
    - Based on what has been made available so far
  - Documentation made available before review
    - Schematics, PCB layout
  - Presentations on review day
    - Motivate design and provide information to answer review questions
    - Expected to be the core of the review
  - Half-day review in the morning
  - Reviewers: APA consortium leaders with possible additional appointments
- ▶ No formal specifications on capabilities of the instrument
  - Essentially only to be faster than laser
    - Nothing about number of channels or precision of tension measurement
  - Review based on open-ended questions

# Preliminary-review questions



1. Does the overall design of the DWA allow to measure wire tension in a DUNE APA according to the quality control plans?
2. Is the DWA ready to be used in a production environment?
3. Are the mechanical and electrical interfaces to the APA wires defined and specified?
4. Is the mechanical support interface for the DWA defined and specified?
5. Can the instrument be used when the APA is in the winder?
6. Are the DWA measurement results satisfactory?
7. Is the precision of the measured tension sufficient?
8. Is the limitation on the minimal wire length for which the tension can be measured acceptable?
9. Is the measurement speed of the DWA compatible with the APA production schedule?
10. Does the instrument follow IPC standards?
11. Does the instrument meet ESH requirements?
12. Can the DWA data acquisition software be used for tension measurement at APA production sites?
13. Is the schedule for the upcoming DWA development steps aligned with the APA production timeline?

# Final-review questions



1. Has the feedback from the preliminary design review been addressed?
2. Does the overall design of the DWA allow to measure wire tension in a DUNE APA according to the quality control plans?
3. Are all interfaces, including to APA wires and for mechanical support, valid and sound?
4. Can the instrument be used in all planned testing environments?
5. Are measurement results related to first-time testing on DUNE APAs satisfactory?
6. Is the overall speed of the electrical wire tension method, including setup and measurement time, compatible with the APA production schedule?
7. Can the DWA satisfactorily test electrical continuity?
8. Is the DWA in a position to measure wire capacitance related to charge splitting for the cold electronics calibration?
9. Does the instrument follow IPC standards?
10. Does the instrument meet ESH requirements?
11. Is the DWA data acquisition software complete?
12. Are the manufacturing plans of the production version of the DWA practical?
13. Is the schedule for the upcoming DWA production steps aligned with the APA production timeline?

# Take-home messages



- ▶ Progress on mechanical support and power distribution
  - Still need more work
- ▶ Starting to test multichannel readout
- ▶ Let's talk about progress next time as part of the DWA preliminary design review!